Memo: Newark Bay CAD
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The State of New Jersey, the Passaic River Federal Trustees, the NY/NJ Baykeeper, and many members of the Passaic community all disapprove of the use of a CAD in Newark Bay. Although CADs are touted as a low cost method for isolation of contaminants, the proposed CAD for Newark Bay will not ensure an efficient or appropriate cleanup. A CAD, which will need to be maintained in perpetuity, is not a complete cleanup for the Diamond Alkali Superfund Site; it is a method for leaving contaminants in place in the same estuarine/river system. It is essential that the EPA consider the negative long term ecological and economic impacts of placing a CAD in Newark Bay.

Ecological Impacts

One of the most concerning issues with the Passaic River CAD is the scale. At a total of 80 acres, the footprint of the Passaic River CAD would be larger than any other CAD site in the U.S. For reference, the New Bedford Harbor CAD in Massachusetts has a footprint of only 8.3 acres. Studies suggest that construction of the Passaic River CAD will take about five years - this five year period will disrupt the subtidal habitats that provide food, refuge, and spawning grounds for many aquatic species within Newark Bay, including over 100 species of fish (NY-NJ HEP 2012). These species are important ecologically, commercially and recreationally. Dredging of sediment from the bay bottom to create the CAD would increase suspended sediment and deposition levels for immobile eggs and fish in early life stages. It would also reduce dissolved oxygen levels, mask pheromones used by migratory fish, and smother immobile benthic macroinvertebrates (EPA 2014b).

Newark Bay is made up of intertidal and subtidal shallow waters that are home to many groundfish, such as winter flounder. Much of the bay is designated by NOAA as Essential Fish Habitat (EPA 2014b). Essential Fish Habitat is defined by NOAA as "the habitat necessary for managed fish to complete their lifecycle, thus contributing to a fishery that can be harvested sustainably" (NOAA). Many native fish populations are under intense pressure and run the risk of extirpation in Newark Bay. Several species in Newark Bay have special status, such as the Atlantic sturgeon, which is a federally listed endangered species. The shallow mudflats are also home to algae, crabs, clams and other invertebrates that serve as prey for fish like striped bass and bluefish (NY-NJ HEP 2012).

Due to years of contamination of the Passaic River, the Newark Bay ecosystem is already particularly susceptible to the negative impacts of construction in the bay. Eelgrass beds and oyster reefs in the bay are almost entirely gone. American shad populations are at historic lows (NY-NJ HEP 2012) and under a multi-agency effort to rebuild the populations. River herring and shad are also under federal and state jurisdictions and the Mid-Atlantic Fishery Management Council recently initiated an

effort to coordinate federal and state agencies in order to increase those populations (MAFMC). Impairment from site-related contamination in Newark Bay has been documented in Atlantic tomcods, killifish, mummichogs, and many other aquatic species. A scientific study from the late 1990s and early 2000s on PCBs in anadromous fish of the Hudson River showed that juvenile Atlantic tomcod in Newark Bay were highly contaminated with PCBs, PCDDs, and PCDFs, compared to tomcods from seven different sites in the Hudson. The Newark Bay tomcods had PCDD levels over 19 times higher than the tomcods sampled in the Hudson River (Yuan 2006). A 2010 study on the health of killifish in Newark Bay showed that these fish suffered from morphological changes indicative of impaired reproductive health and endocrine disruption. Both male and female killifish exhibited decreased gonad weight and inhibited gonad development. The study concluded that "Similar effects on the reproductive development in less resilient species may limit their ability to repopulate the NY-NJ Harbor Estuary and similarly contaminated water systems" (Bugel 2010).

Long-term construction of a CAD in the bay is likely to lead to the decline of sensitive aquatic populations. The loss of native species in Newark Bay also means a loss of ecosystem services such as nourishment, clean water, protection from floods and erosion, and recreational opportunities (NY-NJ HEP 2012). The severe decline in the Eastern oyster population, for example, has widespread negative impacts on water quality in the bay. While oyster populations were historically depleted purely due to overfishing, Eastern oyster populations in Newark Bay today are at record lows in part due to the presence of toxic contaminants. As filter-feeders, oysters remove excess nutrients, algae, and pollutants from the water. An adult oyster can filter up to 50 gallons of water per day. Studies have shown that PCB exposure in sexually immature oysters impairs both lipid metabolism and reproductive success (Chu 2003).

Human Health Impacts

Recreational opportunities on the Lower Passaic River and in Newark Bay are also severely limited. The New Jersey Department of Environmental Protection fish and crab consumption advisories state that no species of fish or crab from the Lower Passaic River and the entire Newark Bay region should be eaten due to contamination (EPA 2014b). There is also a commercial fishing ban on striped bass (NJ Division of Fish and Wildlife 2012). The resuspension of contaminated sediments in the water during CAD construction and "filling" is a risk to human health as well. Not only will the resuspended contaminants come into contact with fish and wildlife, but people using the bay by boat are put at higher risk of coming into contact with toxic contaminants.

Construction Issues

While preliminary studies estimate that construction of the CAD cell will take about five years, it is very likely that construction could take much longer. The possible technical delays that the construction team may run into is one issue, while a more immediate concern is the seasonal dredging restrictions in Newark Bay for the migration of diadromous fish. These restrictions can change from year to year and are dependent upon the reproductive success of fish populations, so it is nearly impossible to predict what seasonal restrictions may be put in place years ahead of time.

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Constructing the CAD will be largely inefficient. Rather than one large CAD cell, the site will actually be made up of multiple CAD cells, each of which will be fifty feet deep. The excavated clay from these cells will then be disposed of in an ocean disposal area offshore (EPA 2014b). This disposal process is not only inefficient, but it risks depositing contaminated sediment further offshore in the ocean, where mobilization of contaminated sediments will take place more quickly than in the bay.

Moving the excavated clay offshore, as well as general construction activities, will increase traffic in Newark Bay. The CAD sites considered by the EPA in the Passaic River Focused Feasibility Study are near major container terminals in the Newark Bay. The Port Newark Container Terminal (PNCT), located in Port Newark on the west side of the bay, occupies 259 acres. In 2011, the PNCT secured a long-term lease agreement to occupy the space through at least 2030. Before the year 2030, the PNCT will invest $500 million into expansion of the port. Already the PNCT handles over 600,000 containers annually, and this number will increase as the port expansion occurs (PNCT 2014). Increased traffic to and from the CAD site could interfere with port commercial traffic, as well as increasing the chances for boat accidents (EPA 2014b).

Even after the CAD cell construction is complete, significant recontamination risks remain. The Passaic River Proposed Plan expressly states that even with sheet pile walls on all sides and a silt curtain across the entrance channel, "some of the dissolved-phase contamination could still escape during dredged material disposal" (EPA 2014b, p. 35). In the document *Recommendations for the Diamond Alkali Superfund Site*, the National Remedy Review Board states that recontamination could occur through resuspension from the cleanup itself or through the transport of contaminants from Newark Bay. The Board points out that recontamination could inhibit the EPA's goal of attaining and maintaining five parts per trillion of dioxin in Newark Bay sediment over time (NRRB 2014). In addition, the Proposed Plan does not account for monitoring leakage from the CAD cell over a long-term scale. The issue with Newark Bay in particular is that the bay is already so polluted that contaminants leaking out of the CAD cell would almost impossible to discern from contaminants that are already present in Newark Bay waters. The Proposed Plan repeatedly mentions that the CAD will require monitoring in perpetuity, but no definitive monitoring measures are proposed or explained.

The cost for the Passaic CAD is estimated to be $1 billion. The cost for off-site disposal is estimated to be $1.7 billion (EPA 2014a). While EPA Headquarters advocates for the CAD because of the decreased cleanup cost, the negative consequences of using the CAD will come in the form of extra funds spent in the future, as the CAD requires a review every five years and maintenance in perpetuity. In the long run, the cost for off-site disposal of contaminated sediments may very well be cheaper than the cost of maintaining the CAD cell.

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CAD versus Off-Site Disposal

While the CERCLA process requires five-year reviews of the CAD, it is likely that more frequent reviews will need to be conducted to verify that no leakage is occurring. Off-site maintenance, on the other hand, is done by permitted facilities and has a finite end date for cleanup. An off-site disposal facility could incinerate up to ten percent of contaminated sediment, whereas a CAD does not treat any contaminants. A CAD would also severely impact the sensitive ecosystem that is Newark Bay, whereas off-site disposal would not have long-term impacts on the bay (EPA 2014a). Construction of the CAD would require five years or more of increased boat traffic in the bay, whereas removing the dredged material by truck and by rail would increase road and rail traffic for a much shorter period of time.

Additionally, the risks of climate change pose more threats to a CAD than to off-site disposal. Climate change will bring more frequent and intense rainstorms, and thus flooding, to New Jersey. In the estuary, this flooding will increase water pollution from runoff and combined sewer overflows. Coastal storms and hurricanes may cause severe damage to the coastline, as well as destroying wetlands, which provide protection for the estuary and bay (NY-NJ HEP 2012). These disruptions to the Newark Bay ecosystem increase the risk for malfunctioning of the CAD.

Other CAD Sites

While it is important to examine the successes and failures of other CADs, it is also important to note that the Passaic CAD cannot be compared to other CADs in terms of size and contaminant concentration. The 80-acre footprint of the Passaic CAD is twice as large as the Puget Sound CAD and almost ten times as large as the New Bedford Harbor CAD. Additionally, the concentration of contaminants and the volume of dredged material for the Passaic Superfund site are both higher than at most other CAD sites. The Puget Sound CAD contains sediments with much lower contaminant concentrations than in the Passaic, and in New Bedford, only the least contaminated sediment was accepted for the CAD (Passaic River Federal Trustees 2014).

The Passaic River Proposed Plan cites the New Bedford Harbor in Massachusetts as a CAD that has been "constructed and maintained in a protective manner" (EPA 2014b, p. 39), yet there are no available data thus far to prove that the CAD is protective. Furthermore, the first CADs at New Bedford Harbor were only completed in 2004 and 2008. These CADs are still relatively new, and sufficient time has not yet passed to determine the ultimate success of these CADs.

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